Pharmacognostical, Phytochemical and Antihypertensive activity of selected plants from family *Asteraceae*

SYNOPSIS OF THE THESIS

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DECLARATION

I hereby declare that the dissertation synopsis entitled **"Pharmacognostical, Phytochemical and Antihypertensive activity of selected plants from family *Asteraceae*"** to be submitted for the partial fulfillment of the Degree of Doctor of Philosophy is my original work and the dissertation has not formed the basis for the award of any degree, diploma, associateship or fellowship of similar other titles. It has not been submitted to any other University or Institution for the award of any degree or diploma.

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CHAPTER – 1

INTRODUCTION

❖ INTRODUCTION

1.1 Medicinal Plants

Medicinal plants or herbs are those plants which have medicinal value in them, these plants used since ancient times for their medicinal purpose and welfare of human beings. These plants mainly use to make Ayurveda medicine, as time passed different pharmaceutical industries also started to use these plants or herbs to manufacture herbal preparation.

The preparation manufacture by these plants is based on established therapeutic efficacy explored from crude extract (1, 2). Now a day's herbal preparations is widely used by different communities for their therapeutic value and have less or fewer side effect with cheap cost. On other hand medicine of synthetic origin has high cost and more side effect as they use different chemicals in them (3, 4).

As the demand increase now a day's almost 30% of the pharmaceutical preparations are based on plants, and most of the developed countries which have less herbs growth they import raw materials of important plants from developing countries (5).

Various plants are continuously evaluated for therapeutic activities and for phytoconstituents (6). The secondary plant metabolites that have pharmacological or toxicological effects in humans and animals are known as bioactive compounds. When analysedphylogenetically, many of these Plant chemicals seem to be synthesized randomly. But they're not always worthless garbage (7).

1.2 Herbal Medicine

Herb offers numerous symbolisms; however, in the context of this it describes a "crude drug of vegetable origin used for the therapy of illness states often a chronic nature or to achieve or to maintain a condition of enhanced health" (8, 9).

Herbal remedies shouldn't be confused with Homeopathic medicine, which was established in the seventeenth century by the German doctor Samuel Hahnemann are also based on the "rule of similar" and "law of dilution," though (10).

1.3 Pharmacognosy

A pharmacognostical analysis is the primary part of the standardization of crude drugs. Standardization of natural products is a sophisticated job because of their heterogeneous arrangement, that is using the complete plant, individual portions of the plant, or plant extracts. Therefore, nowadays there has been

an instant upsurge in the standardization of selected medicinal plants of potential very worthwhile significance (11).

1.4 Pharmacology

Pharmacology developed in the 19th century similar to biomedical science used the principles of scientific assessment in a remedial context. Nowadays Pharmacologists use the potency of genes, molecular biology, chemistry as well as other advanced resources to remodel specifics of molecular mechanisms (12).

1.5 Cardiovascular Disorder

Myocardial infarction (MI) is the acute condition that occurs when there is imbalance between coronary blood supplies and does not full fill the myocardial oxygen demand (28).

As the study goes on and different experiments done which provide the clinical evidences which reveals the involvement of reactive oxygen species in cardiovascular diseases (29).

More specifically in pathological or disease conditions, such as MI, diabetes, or stroke, the production of free radicals may override the scavenging effects of antioxidants leading to oxidative stress (30) (31).

1.5 [A] Antioxidant

Herbal drugs which have high antioxidants play an essential role in the prevention of cardiovascular diseases and many more like cancers and also neurodegenerative diseases (14).

Antioxidants are substances that protect your cells against free radicals, which play a role in heart disease, cancer and other diseases.

Antioxidant vitamins and minerals, such as vitamins A, E, and C, and zinc may slow the development and progression of cardiovascular diseases.

1.5 [B] Hypertension

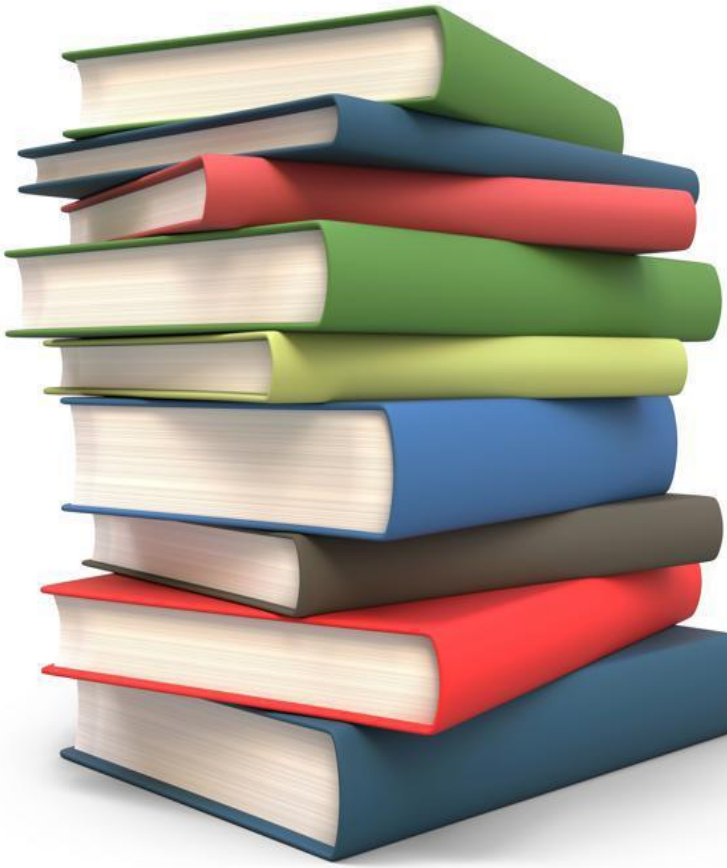
Hypertension (high blood pressure) is when the pressure in your blood vessels is too high (140/90 mmHg or higher). It is common but can be serious if not treated.

People with high blood pressure may not feel symptoms. The only way to know is to get your blood pressure checked (15).

1.5 [C] Cardiotonic

Cardio tonic are drugs used to increase the efficiency and improve the contraction of the heart muscle, which leads to improved blood flow to all tissues of the body. Cardiotonic drugs increase the force of the contraction of the muscle (myocardium) of the heart.

When the force of contraction of the myocardium is increased, the amount of blood leaving the left ventricle at the time of each contraction is increased. When the amount of blood leaving the left ventricle increases, cardiac output (the amount of blood leaving the left ventricle with each contraction) is also increased (16).



CHAPTER-2

LITERATURE REVIEW

❖ LITERATURE REVIEW

2.1 Introduction

Herbal plants are great source of pharmacological and also toxicological activities that's why many laboratories are engaged in screening plants for their pharmacological and toxicological perspective.

The following plants are chosen for thorough exploration and investigation of their phytochemical and pharmacological attributes.

In the present chapter, the author gives a literature study that was performed and also recorded.

2.2 Out of these studies plant *Erigeron Canadensis, Bidens Pilosa, and Ageratina Adenophora.*

2.2.1 A Literature review and plant profile of selected plant of *Erigeron Canadensis*

An extensive literature survey was conducted on pharmacognostical, phytochemical and antihypertensive activity of present in *Erigeron canadensis* and the information is as follows.

- **Pharmacognostical study of *Erigeron canadensis***

Macroscopic, Leaf microscopy, Stem microscopy study is performed.

- **Phytochemical study of *Erigeron canadensis***

Qualitative phytochemical tests

Loss on drying reveals the presence of water in the plant powder and also some volatile organic matter.

Standardization of raw drug	
Parameters	**Quantitative values (%w/w)**
Loss on dry in 105° C	8.80-9.20
Total ash	9.20-9.87
Acid insoluble ash	1.62-1.76
Water soluble ash	2.50-3.00
Alcohol soluble extractive	8.50-9.50
Water soluble extractive	18.62-19.80

Extractive values in	
Toluene	2.20-2.50
Chloroform	3.01-3.95
Methanol	10.40-11.20

- **High-performance thin layer chromatography fingerprinting**

The profile chromatographic separation scanned at 254 nm reveals six spots; out of which one possess maximum composition with RF at 0.89, while the densitogram scanned at 366 nm revealed nine spots with spot no. 4 and 5 showing maximum composition at RF 0.33 and 0.43, respectively. It is evident from the data that these are characteristic for the studied drug, which will help in indent caption and authentication of the mother tincture of the drug. These are considered as valuable standards in pharmacopeia. At 254 nm, six spots appear at Rf 0.17, 0.33, 0.45, 0.61, 0.76, and 0.89 (all are brown) with various concentrations, while at 366 nm, nine spots appears at Rf 0.12 (blue),0.17 (blue), 0.26 (blue), 0.33 (red), 0.43 (blue), 0.56 (red), 0.70 (blue), 0.76 (blue), and 082 (blue). These are again vital fingerprint parameters for the prepared mother tincture and ensure the reliability and reproducibility of the drug (17).

- **Pharmacological study of *Erigeron Canadensis***

Pharmacological studies showed that Erigeron *Canadensis* exerted antimicrobial, antioxidant, anticoagulant, anti-inflammatory, antihypertensive activity, anticancer, mutagenic gastric protective effect and skin depigmentation activity (18).

- **Plant Profile of Erigeron *Canadensis***

- **Botanical Name:**
  - ❖ Erigeron *Canadensis*
- **Vernacular Names:**
  - ❖ English: - Horseweed
  - ❖ Hindi: - Gajar Ghass
  - ❖ Sanskrit: -Jarayupriya
- **Scientific classification:**
  - ❖ Botanical Name: - Erigeron *canadensis*
  - ❖ Kingdom: - Plantae
  - ❖ Family: - Asteraceae
  - ❖ Genus: - Erigeron
  - ❖ Species: - E. *canadensis*

➢ **Botanical description and distribution**

- Horseweed originated in North America and Central America and is widespread in its native range.
- It has spread to inhabited areas of most of the temperate zone of Asia, Europe, and Australia.
- It is found in India from Himachal, Assam, Mandi, etc. (19).

2.2.2 A Literature review and plant profile of selected plant *Bidens Pilosa*

An extensive literature survey was conducted on pharmacognostical, phytochemical and antihypertensive activity of present in *Bidens Pilosa* and the information is as follows.

➢ **Pharmacognostical Study of *Bidens Pilosa***

Macroscopic, Leaf microscopy, Stem microscopy study is performed.

➢ **Phytochemical study of *Bidens Pilosa***

The major substances identified in *B. pilosa* are polyacetylenes, flavonoids, and triterpenes, and some essential oils; these are considered as the main active constituents responsible for the various pharmacological actions of the plant (20).

➢ **Pharmacological study information of *Bidens Pilosa***

Pharmacological studies showed that Bidens*Pilosa* exerted antimicrobial, antioxidant, anticoagulant, anti-inflammatory, anticancer, anti-malarial, Anti-diabetic, Anti-hypertension, anti-allergic, anti-ulcer (21).

➢ **Plant Profile of *Bidens Pilosa***

- **Botanical Name**
  - ❖ *Bidens Pilosa*
- **Vernacular names:**
  - ❖ English: - Black-jack
  - ❖ Hindi: - Kumra
  - ❖ Gujarati: - Phutium
  - ❖ Manipuri: - Hamengsampakpi
- **Scientific classification:**
  - ❖ Kingdom: - Plantae
  - ❖ Class: - Magnoliopsida
  - ❖ Family: - Asteraceae
  - ❖ Genus: - Bidens
  - ❖ Species: -Bidens Pilosa L.

➢ **Botanical Description**

- It has white or yellow flowers, and long narrow ribbed black achenes (seeds).
- It grows to an average height of 60 cm and a maximum of 150 cm in favourable environments. *B. pilosa* prefers full sun and moderately dry soil (22).

2.2.3 A Literature review of *Ageratina Adenophora*

An extensive literature survey was conducted on pharmacognostical, phytochemical and antihypertensive activity of present in *Ageratina Adenophora* and the information is as follows.

- **Pharmacognostical study of Ageratina*Adenophora***

Macroscopic, Leaf microscopy, Stem microscopy study is performed.

- **Phytochemical study of *Ageratina Adenophora***

These are some phytochemicals present in *A. Adenophora* with Main protease protein (Mpro) and human ACE2 i.e. 7-hydroxy-dehydrotremetone, 7,10,11-tri-hydroxyl dehydrotremetone, 10-oxo-7-hydroxy-nordehydrotremetone, 3-dihydrobenzofuran, 5-b-glucosyl-7-demethoxy-encecalin (5GDE), 8-hydroxy-8-b-glucosyl-2-carene,(4S,4aR,6R)-1-acetyl-6-(acetyloxy)-4,4a,5,6-tetrahydro-4,7-dimethylnaphthalen-2 (3H)-one, 9-oxoagerophorone(OA), etc (23, 24).

- **Pharmacological study information of *Ageratina Adenophora***

Pharmacological studies showed that *Ageratina Adenophora* exerted antimicrobial, anti-hypertensive activity, antioxidant, anticoagulant, anti-inflammatory, Antibacterial effects, Antifungal effects, Antiviral effects, Anti-nematode and insecticidal effects (25).

- **Plant profile of the *Ageratina Adenophora***

The plant names, localities, and dates of collection are furnished below:

- **Botanical Name**
  - *Ageratina Adenophora*
- **Vernacular Names:**
  - **English: -**Mexican devil
  - **Hindi: -** Chota Dhatura
  - **Malayalam: -**Kammunistapachcha (26)
- **Scientific classification:**
  - Kingdom: - Plantae
  - Family: - Asteraceae
  - Genus: - Ageratina
  - Species: - *A. adenophora*

- **Botanical description**

- *Ageratina adenophora* is a perennial herbaceous shrub that may grow to 1 or 2 meters (3.3 or 6.6 ft) high.
- It has opposite trowel-shaped serrated leaves that are 6–10 cm (2.4–3.9 in) long by 3–6 cm (1.2–2.4 in) in width.
- The small compound flowers occur in late spring and summer, and are found in clusters at the end of branches. Each flower head is up to 0.5 cm in the diameter and creamy white (27).

CHAPTER-3

AIM AND 0BJECTIVE

❖ AIM AND OBJECTIVE

3.1 Aim: Pharmacognostical, Phytochemical and Antihypertensive activity of selected plants from family *Asteraceae* with the following objectives

3.2 Objectives

- Collection and authentication of plants
- Extraction to isolate the Phytochemical screening
- Pharmacognostical evaluation (macroscopic evaluation, microscopic evaluation, determination of ash value, extractive value, loss on drying, ph analysis).
- Characterization (TLC, HPTLC) of phytochemical constituents of selected plants
- Screening the Antihypertensive activity of selected plants

CHAPTER-5

PROPOSED RESEARCH METHODOLOGY

❖ Proposed Research Methodology

- **Literature survey:** This will include detailed survey of selected plant habit and habitat, collection of required literature, information related to scientific work carried out and its traditional uses.

- **Selection, collection and authentication of plants:** Plants will be shortlisted from the mentioned plants; two to three will be selected and collected on the basis of literature survey and ethno pharmacological claims. The selected plant will be authenticated from expert and processed for further investigation.

- **Processing of crude drug:** Collected plant species will be processed and made suitable for extraction.

- **Pharmacognostical evaluation:** The Pharmacognostical evaluation of selected plant will be carried out which includes morphological evaluation, microscopic evaluation, and physicochemical evaluation.

- **Extraction of plant material with various solvents:** Selected plant parts will be subjected to suitable extraction methods. The choice of solvent for extraction & method will be decided according to nature of phytochemical constituents of selected plant parts.

- **Phytochemical evaluation of plant extracts and isolation of phytoconstituents:** The obtained extracts will be subjected for preliminary phytochemical investigation. Qualitative analysis and standardization will be carried out for detection and quantization of phytoconstituents by possible standard methods. Isolation and characterization of phytoconstituents(s) will be carried out.

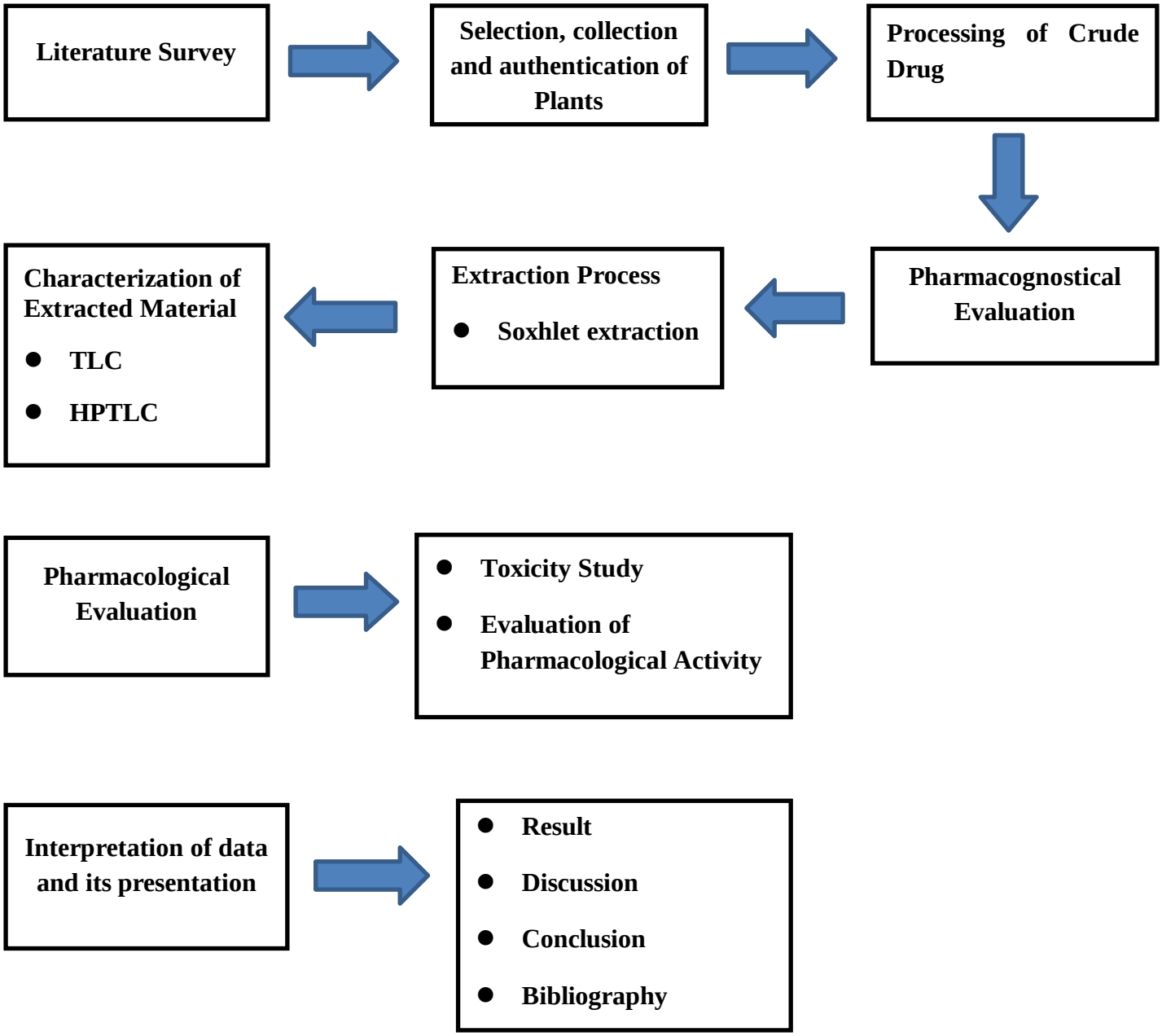
- **Pharmacological evaluation:** The extract will be subjected for pharmacological screening according to phytochemical profile and ethno botanical claims.

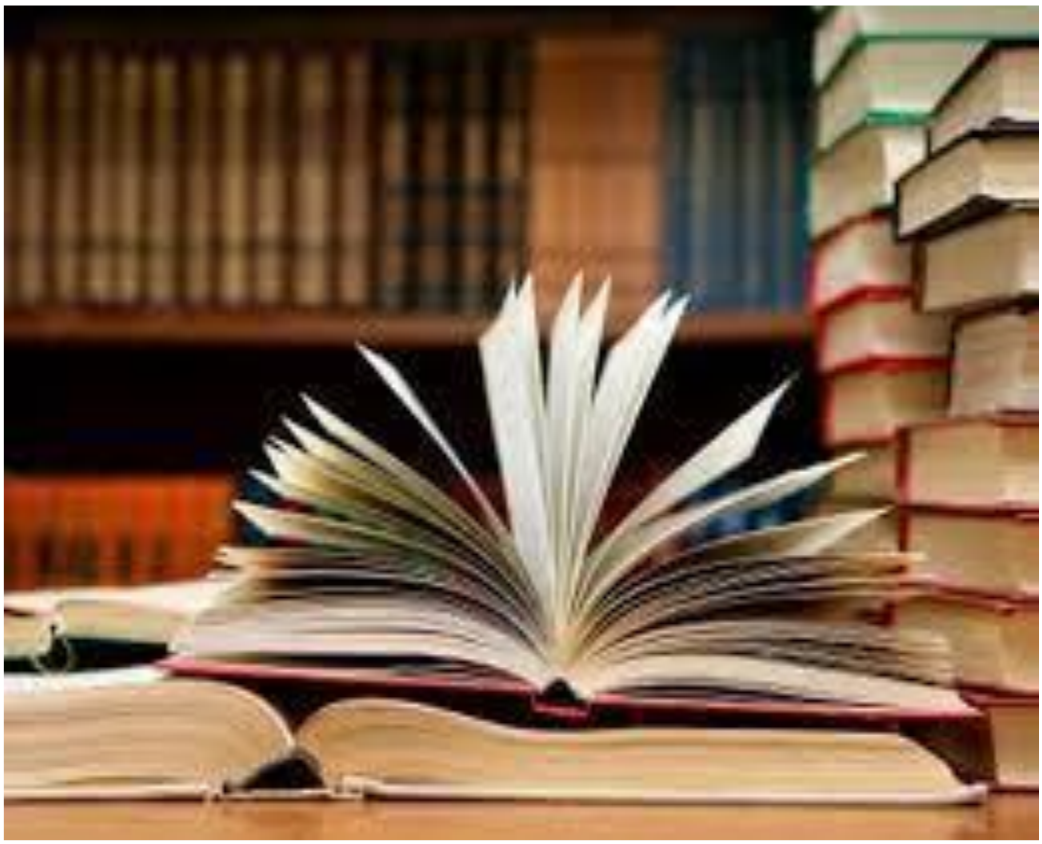
- **Toxicity studies:** The toxicity study will be carried out as per guidelines given by Organization for Economic Co-operation and Development (OCED-423).

- **Evaluation for pharmacological activity:** The obtained extracts will be screened for pharmacological potential using suitable method(s). Pharmacognostical, Phytochemical & Antihypertensive Activity of selected plants from family *Asteraceae*.

- **Interpretation of data and its presentation:**
  - **Result:** The results obtained will be displayed through various tables, charts, photographs, graphs, bar diagrams and other records. Results shall be statistically analyzed to reveal the level of their significance.
  - **Discussion:** On the backgrounds of literature reviews and the results obtained by the proposed work, the result shall be discussed for all sorts of scientific as well as proven possibilities and suitable conclusion shall be drawn.
  - **Conclusion:** These will be drawn from the discussion of experimental outcome, results obtained and author`s own opinions on performed work.
  - **Bibliography:** A complete list of all the relevant references shall be attached at the end of the dissertation. The dissertation will be written as per instruction and guidelines provided by the university.

❖ Tentative chapter plan





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REFERENCES

❖ Reference

1. Hassan LG, Mshelia HE, Umar KJ, Kangiwa SM, Ogbiko C, Yusuf AJ. Phytochemical Screening, Isolation and Characterization of Beta-Sit sterol from ethyl acetate Extract of Stem Bark of Entadaafricana (Fabaceae) Guill.etPerr. J ChemSoc Niger. 2018; 43(3).

2. Youssef FS, Hamoud R, Ashour ML, Singab AN, Wink M. Volatile oils from the aerial parts of Eremophilamaculata and their antimicrobial activity. Chem. Bio divers. 2014; 11(5):831–41.

3. Rash rash M, Schommer JC, Brown LM. Prevalence and predictors of herbal medicine use among adults in the United States. J patient Exp. 2017; 4(3):108–13.

4. Kumar M, Prakash S, Radha, Kumari N, Pundir A, Punia S, et al. Beneficial role of antioxidant secondary metabolites from medicinal plants in maintaining oral health. Antioxidants. 2021; 10(7):1061.

5. Nweze C, Ibrahim H, Ndukwe GI. Beta-sitosterol with antimicrobial property from the stem bark of pomegranate (Punicagranatum Linn). J Applica Environ Manag. 2019; 23(6):1045–9.

6. Sani, Y., Musa, A., Pateh, U., Haruna, A., Yaro, A., Sani, M., Magaji, M. 2014. Phytochemical screening and preliminary evaluation of analgesic and anti-inflammatory activities of the methanol root extract of Cissuspolyantha. Bayero Journal of Pure and Applied Sciences, 7(1), 19-23.

7. Singh, S., Singh, D.B., Singh, S., Shukla, R., Ramteke, P.W. and Misra, K., 2019. Exploring medicinal plant legacy for drug discovery in post-genomic era. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences, 89(4), 1141-1151.

8. Azmir, J., Zaidul, I.S.M., Rahman, M.M., Sharif, K.M., Mohamed, A., Sahena, F., Jahurul, M.H.A., Ghafoor, K., Norulaini, N.A.N. and Omar, A.K.M., 2013. Techniques for extraction of bioactive compounds from plant materials: A review. Journal of food engineering, 117(4), 426-436.

9. Israel, D. and Youngkin, E.Q., 1997. Herbal therapies for perimenopausal and menopausal complaints. Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy, 17(5), 970-984.

10. Yang, A.J., 2017. Physical medicine and rehabilitation and electro diagnosis. Pain Medicine Board Review, 173-189.

11. Mangathayaru, K., 2013. Pharmacognosy: an Indian perspective. Pearson Education India.1-4

12. Boobis, A.R., Cohen, S.M., Dellarco, V.L., Doe, J.E., Fenner-Crisp, P.A., Moretto, A., Pastoor, T.P., Schoeny, R.S., Seed, J.G. and Wolf, D.C., 2016. Classification schemes for carcinogenicity based on hazard-identification have become outmoded and serve neither science nor society. Regulatory Toxicology and Pharmacology, 82, 158-166.

13. Kumar, S., and Pandey, A. K. 2017. Medicinal attributes of Solanumxanthocarpum fruit consumed by several tribal communities as food: an in vitro antioxidant, anticancer and anti HIV perspective. BMC Complementary and Alternative. Medicine. 14 (1), 112.

14. Gheena, S. and Ezhilarasan, D. 2019, "Syringic acid triggers reactive oxygen species–mediated cytotoxicity in HepG2 cells", Human and Experimental Toxicology. 38(6):694-702.

15. Karthiga, Rajesh kumar, S. and Annadurai, G. 2018, "Mechanism of Larvicidal Activity of Antimicrobial Silver Nanoparticles Synthesized Using Garcinia mangostana Bark Extract", Journal of Cluster Science.29 (6), 1233-1241.

16. Lakshmi, T., Krishnan, V., Rajendran, R. and Madhusudhanan, N. 2015, "Azadirachtaindica: An herbal panacea in dentistry - An update", Pharmacognosy Reviews.9 (17), 41-44.

17. Menon, S., Ks, S.D., Santhiya, R., Rajesh kumar, S. and S, V.K. 2018. "Selenium Nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism", Colloids and Surfaces B: Biointerfaces. 170,280-292.

18. Pogaku, PadmaRao & Palani, Subramanian & Penthala, Sudhakar & Narayana, Psreeman & Mukkamula, Nagaraju. (2017). Pharmacognostical and physicochemical evaluation of homoeopathic drug: *Erigeron* Canadensis L. Indian Journal of Research in Homoeopathy. 11-26. 10.4103/0974-7168.200841.

19. Al-Snafi, Ali. (2017). PHARMACOLOGICAL AND THERAPEUTIC IMPORTANCE OF ERIGERON CANADENSIS (SYN: CONYZA CANADENSIS). Indo Am J P Sci. 4. 248-256. 10.5281/zenodo.344930.

20. POWO (2023). "Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; http://www.plantsoftheworldonline.org/ Retrieved 24 November 2023."

21. Xuan TD, Khanh TD. Chemistry and pharmacology of Bidenspilosa: an overview. J Pharm Investing. 2016; 46(2):91-132. Doi: 10.1007/s40005-016-0231-6. Epub 2016 Mar 30. PMID: 32226639; PMCID: PMC7099298.

22. Bartolome AP, Villaseñor IM, Yang WC. Bidenspilosa L. (Asteraceae): Botanical Properties, Traditional Uses, Phytochemistry, and Pharmacology. Evid Based Complement Alternat Med. 2013; 2013:340215. Doi: 10.1155/2013/340215. Epub 2013 Jul 1. PMID: 23935661; PMCID: PMC3712223.

23. Jamir, Nungshioba & Mazumder, Muslek Uddin & Khazeo, P. & Puro, Nusalu & Jyrwa, Rosamund & Sailo, Lalzikpuii. (2018). Pharmacognostical study of the leaf of Ageratina adenophora. 10.2991/msc-18.2018.24.

24. Neupane NP, Karn AK, Mukeri IH, Pathak P, Kumar P, Singh S, Qureshi IA, Jha T, Verma A. Molecular dynamics analysis of phytochemicals from Ageratina adenophora against COVID-19 main protease (Mpro) and human angiotensin-converting enzyme 2 (ACE2). Biocatalyst Agric Biotechnology. 2021 Mar; 32:101924. doi: 10.1016/j.bcab.2021.101924. Epub 2021 Jan 27. PMID: 33527003; PMCID: PMC7839396.

25. Sun W, Liu SS, Zhao CC. Biological properties of active compounds from Ageratina adenophora. SAGE Open Med. 2023 May 15; 11:20503121231167964. doi: 10.1177/20503121231167964. PMID: 37205157; PMCID: PMC10186572.

26. Flowers of India. Retrieved August 23, 2016, from http://www.flowersofindia.net

27. Wikipedia contributors. (2023, September 14). Ageratina adenophora. In Wikipedia, The Free Encyclopedia. Retrieved 14:41, November 24, 2023, from https://en.wikipedia.org/w/index.php?title=Ageratina_adenophora&oldid=1175337314